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## Notes on Microhylid Frogs, Genus *Cophixalus*, from New Guinea

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The American Museum of Natural History has been fortunate to receive several collections of reptiles from Northeast New Guinea from the Rev. O. Shelly, S.V.D. Recently Father Shelly assembled a collection of amphibians and reptiles in the Wahgi Valley region of the central highlands of New Guinea. Included in this collection were three species of microhylid frogs, one of them representing an undescribed form, which serve as the basis for the present note.

Evidently the central highlands of New Guinea have a frog fauna with a high degree of endemism. Four of the five microhylid frogs (including the new species described herein) found in the region of the Hagen and Bismarck Mountains are unknown elsewhere. The endemic species are *Asterophrys wilhelmana*, *Cophixalus darlingtoni*, *C. parkeri*, and *C. shellyi*. One species, *Sphenophryne brevicrus*, is found also in the mountains of Netherlands New Guinea, far to the west. A similar situation apparently prevails among the hylids. Loveridge (1945) described *Hyla darlingtoni*, *H. angularis*, and *H. becki*, all from Mt. Wilhelm, and Forcart (1953) described *Nyctimystes flavomaculata* from the same region. Three species of *Hyla* are known from this region and elsewhere: *H. arfakiana*, *H. angiana*, and *H. montana*. The only ranid known in the area, *Rana grisea*, is widespread. Undoubtedly the fauna is not thoroughly sampled.

The frogs collected by Father Shelly were obtained at Kondiu. This locality is at an elevation of about 5000 feet in the Wahgi Valley across the Wahgi River (northeast) from Kup, about 10 miles south and 15

miles west of Mt. Wilhelm. An excellent description of the region and a map are presented by Mayr and Gilliard (1954, pp. 321–324, fig. 1).

*Cophixalus shellyi*, new species

*Cophixalus ateles*, ZWEIFEL, 1956, p. 34.

HOLOTYPE: A.M.N.H. No. 58551, adult female, collected in 1955 by the Rev. O. Shelly, S.V.D., at Kondiu, across the Wahgi River from Kup, elevation about 5000 feet, Northeast New Guinea.

PARATYPES: A.M.N.H. No. 58552, from the type locality, and A.M.N.H. No. 58170, from Mt. Hagen, 8000 feet, about 55 miles east-southeast of the type locality.

DIAGNOSIS: Differs from all species of *Cophixalus* except *C. ateles* in possessing a very short first finger, its length being less than one-half of the length of the second. Differs from *C. ateles* in the following ways: tympanum very indistinct; finger discs relatively smaller; side of head black, sharply contrasting with dorsal and lateral body surfaces.

DESCRIPTION OF TYPE SPECIMEN: No maxillary or vomerine teeth; maxillae not overlapping in front of the premaxillae (eleutherognathine); no clavicle or procoracoid; no omosternum, sternum cartilaginous; terminal phalanges T-shaped.

The tongue is smooth and about three-quarters free behind. The palatal ridges are low and indistinct. Finger and toe discs slightly enlarged, the third finger disc larger than disc of the fourth toe. The third finger disc is about twice the width of the penultimate phalanx, the fourth toe disc little wider than the penultimate phalanx. Fingers in decreasing order of length 3–4–2–1, toes 4–3–5–2–1. The first finger is less than half of the length of the second, and bears no distinctly enlarged disc, its slightly swollen tip being no wider than the penultimate phalanx. Sub-articular and metatarsal tubercles are very poorly developed, almost indistinguishable. The snout is obtusely pointed and very slightly longer than the orbit, the ratio of snout length to orbit length being about 1.1. The canthus rostralis is not sharp, and the loreal region is nearly vertical. The interorbital space is wider than an upper eyelid. A very faint supratympanic fold is in evidence. The legs are relatively long; ratio of leg length to snout–vent length, 0.44. Snout–vent length, 16.5 mm.; tibia length, 7.2 mm.; head width, 5.8 mm.

In preservative, the type is gray dorsally. There are an irregular dark interocular mark and a faint lighter mid-vertebral line with a border slightly darker than the ground color (fig. 1B). The side of the head is black, in marked contrast to the dorsal surface of the head and body. The

dark color occupies all the side of the face and the end of the snout, and continues posteriorly to include part of the ear (fig. 1A). The anterior surface of the foreleg is dark, the color being continuous with that of the side of the head. The ground color of the flanks is the same as the dorsal ground color; some darker spots are present. The back of the tarsal region and the sole of the foot are dark. The under surfaces of the body and legs are mottled with dark gray on a lighter background.



FIG. 1. *Cophixalus shellyi*, new species. A. Side of head, paratype, A.M.N.H. No. 58552. B. Dorsal view, type specimen, A.M.N.H. No. 58551. Scale line indicates 1 cm.

VARIATION: All three specimens are females, so the presence or absence of the vocal sac in this species is not yet known. The specimen from Mt. Hagen was darkened by preservative and stained with rust; hence the distinctive color pattern evident in the two specimens more recently received was not detected when this specimen was referred to

*C. ateles* (Zweifel, 1956, p. 34). In color and pattern, the two well-preserved specimens are very similar, though the vertebral line of the type is not present in the other. The toe and finger discs are roughly the same size in the two paratypes, the finger discs being slightly smaller than in the type. The first finger is very small in all three specimens. The tympanum is very indistinct in all. Its diameter is approximately 0.5 to 0.6 that of the orbit, but indistinct outlines make the measurements (made with an ocular micrometer in a binocular dissecting microscope) none too certain. The snout length in the three specimens is 0.9, 1.1, and 1.2 times the orbit length. The tibia length/snout-vent length ratio is 0.47, 0.44, and 0.45. The specimens are very similar in size, two measuring 16.5 mm. in snout-vent length, and one 15.0 mm.

DISCUSSION: The very short first finger of *shellyi* should at once distinguish it from all other species of *Cophixalus* except *C. ateles* Boulenger. This species was based on "several specimens" from Moroka in the Bartholomew Range at an elevation of 2300 feet in the Territory of Papua (Boulenger, 1898, p. 708). This locality is about 350 miles southeast of the type locality of *C. shellyi*.

In the absence of specimens of *ateles*, I base my comparison of *shellyi* and *ateles* on the description of two cotypes given by Parker (1934, pp. 172-173). All fingers of *ateles* except the first are said to have large, truncate discs. The illustration in Boulenger (1898, pl. 8, fig. 4A) shows discs approximately three times the width of the penultimate phalanx, while in *shellyi* the discs are two or less times as wide as the phalanx. However, Boulenger's figure may be misleading, because Parker (1934, p. 172) notes that the length of the first finger is incorrectly depicted in Boulenger's illustration. The tympanum of *ateles* is said to be distinct, while in *shellyi* it is scarcely discernible.

*Cophixalus ateles* is described by Parker as follows: "Grey or pale brown above, the flanks and upper surfaces of the snout yellowish; the colour of the flanks forms a more or less regular streak from the eye to the groin which may be edged above by darker; a light cross-bar connecting the upper eyelids bordered behind by darker. A faint dark W-shaped mark may be present on the anterior part of the back and a light vertebral stripe may be present. Lower surfaces lighter, more or less profusely dusted with dark brown; forearm with a distinct brown annulus; anal region blackish." The difference in color between the upper surface of the snout and the back, and between the flanks and the back is not seen in *shellyi*; there is no tendency for a streak from the eye to the groin, nor is there a light interocular cross bar. The forearm of *shellyi* does not

have a distinct brown annulus. Conspicuously absent in the description of *ateles* is mention of the black mask of *shellyi*.

It is not certain that the apparently diagnostic characters of *C. shellyi* will continue to appear so when more specimens of *shellyi* and *ateles* become available, and it is possible that the relationship between the two may be closer than their present specific allocation implies. The distinctness of the tympanum shows some variation in some other microhylids, finger and toe disc size varies, and in some species color pattern is highly variable. Yet in others, structure and pattern are quite constant. The acquisition of more specimens, together with data on their habitat and appearance in life, is needed before the relationships of *shellyi* can be determined with satisfaction.

*Cophixalus darlingtoni* Loveridge

*Cophixalus biroi darlingtoni* LOVERIDGE, 1948, pp. 423-424.

*Cophixalus darlingtoni*, ZWEIFEL, 1956, p. 44.

In a footnote in my previous paper dealing with New Guinea microhylids, it was suggested that *C. biroi darlingtoni* was sufficiently distinct from *C. biroi* to deserve specific recognition. This suggestion was based on my examination of nine specimens of *darlingtoni* out of a much larger series from the type locality in the Museum of Comparative Zoölogy. The present specimens, 56 in number, are from about 25 miles to the west of the type locality, Toromanbanau, and conform to the diagnostic characters of the form as based on Loveridge's original description.

The relative lengths of the third and fifth toes will serve to distinguish *C. darlingtoni* from all known *Cophixalus* with the exception of *C. variegatus* and *C. rostellifer*. In these three species the fifth toe is longer than the third, while in all others the third is longer or the two are approximately equal. In the vast majority of specimens of *darlingtoni* the fifth toe is clearly longer than the third. While in a very few individuals the difference is not so marked, the third is never longer than the fifth. *Cophixalus rostellifer* has an elongate snout, the length being at least twice the orbit length. The snout of *darlingtoni* is, at the longest, only very slightly longer than the orbit. *Cophixalus variegatus* is a small species, maximum known length 18 mm. (as against 26 mm. in *darlingtoni*), and probably has relatively longer legs. In three specimens of *variegatus* that I have measured, the tibia length/snout-vent length ratio is 0.34, 0.36, and 0.40 (mean 0.367). This contrasts with a mean of  $0.301 \pm 0.003$  for adult *darlingtoni* (see below).

The relative lengths of the orbit and snout, expressed as the ratio of snout length to orbit length, range from 0.85 to 1.11, mean 0.99, in 27 specimens. Probably some effect of ontogenetic variation is present, but when such small distances on small specimens are dealt with, variation is largely obscured by error in measurement. However, ontogenetic variation in leg length is evident. Among the measurements of 35 individuals, the 10 smallest individuals have a tibia length/snout-vent length mean of 0.333 (0.029–0.37), while the 10 largest specimens have a mean of



FIG. 2. *Cophixalus darlingtoni* Loveridge. The light interorbital line appears to be a fairly constant feature of an otherwise highly variable pattern. A.M.N.H. No. 58545, Kondiu near Kup, Wahgi Valley, Northeast New Guinea. Scale line indicates 1 cm.

0.297 (0.26–0.33). The first group includes specimens ranging from 13.2 to 20.2 mm. in length, the larger group 23.1 to 26.5 mm. For all specimens 20 mm. or greater in body length, the mean is  $0.301 \pm 0.003$ , range 0.26–0.34,  $n = 26$ . This is not significantly different from the mean of  $0.306 \pm 0.004$  given for nine specimens in my previous paper (Zweifel, 1956, table 4, p. 39). Relative leg length is a valuable tool in distinguishing between various forms of Papuan microhylids. For example, when the present lot of specimens was dealt with, a single individual of

*Cophixalus parkeri* was confused with the many *darlingtoni* until its relative leg length (0.38) was noted to be somewhat greater than other specimens in its size group, whereupon a more careful examination revealed its other distinctive characters.

The color pattern of *C. darlingtoni* is highly variable. A thin mid-vertebral line is present in some individuals, absent in others. A few have a broad light stripe in this region. The dorsal ground color ranges from deep plumbeous to pale yellowish tan in different individuals. Darker markings are present, and are often arranged as continuous or paired lateral blotches. One marking is very consistent: this is a pale, golden,



FIG. 3. *Cophixalus parkeri* Loveridge. A.M.N.H. No. 58547, Kondiu near Kup, Wahgi Valley, Northeast New Guinea. Scale line indicates 1 cm.

interocular line. Among 56 specimens, the mark is absent only three times and is indistinct in seven other instances. Where obscure, it is because the line is broken, diffuse, or indistinguishable from the ground color. An indistinct ocellus is often present in the groin. The venter is pale and nearly immaculate in some specimens, clouded with gray in others. (See fig. 2.)

*Cophixalus parkeri* Loveridge

*Cophixalus variegatus parkeri* LOVERIDGE, 1948, pp. 425-426.

*Cophixalus parkeri*, ZWEIFEL, 1956, p. 44.

This species has been known from only two specimens, the type from Mt. Wilhelm, and the second individual from Mt. Hagen, 70 miles to the west. The specimen collected by Father Shelly is from an intermediate location.

The Kondiu and Mt. Hagen specimens differ from Loveridge's description of the type in that the first finger is not "much shorter than the second," but is more than half of its length. However, on examination of the type specimen, I find the first finger to be half of the length of the second and not at all like the very small first finger of *C. shellyi* and *C. ateles*. The Kondiu specimen agrees in general with the color and pattern of the type and, in particular, agrees in possessing a broad, light transverse bar uniting the eyelids (fig. 3). The presence of this mark in the Mt. Hagen specimen is suggested, but owing to discoloration and rust stain, the pattern can only dimly be distinguished. The relative leg length of the Kondiu specimen is the same as that of the Mt. Hagen specimen; tibia length/snout-vent length = 0.38.

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